Supplementary Material

Association between maternal exposure to phthalates and lower language ability in offspring derived from hair metabolome analysis.

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Supplementary Table 1: Tests of association between participant charateristics and raw BSID-III score. Association p-values, test statistics, and degrees of freedom are based on Welch's t-test for binary variables, ANOVA for categorical variables with more than two categories, and tests of correlation for continuous variables. Cells for significant tests (p< 0·05) are shown in bold

Participant Characteristics	Frequencies or Mean (sd)	p-value for association with raw score; and r, or F with degrees of freedom. For F test with p< 0.05, the category with the highest score is indicated.				
		Cognitive	Receptive Language	Expressive Language	Fine Motor	Gross Motor
Ethnicity	Chinese: 58% Malay: 26% Indian: 16%	0.31 $F_{2,366}$=1.18	**0.02** **$F_{2,365}$=4.18** **Chinese**	0.71 $F_{2,364}$=0.37	0.40 $F_{2,362}$=0.93	**<0.01** **$F_{2,360}$=7.22** **Malay**
Maternal age at recruitment (years)	31.1 (4.8)	0.19 r=0.07	0.14 r=0.08	0.65 r=0.02	0.78 r=0.01	0.35 r=-0.05
Highest Level of Maternal education	University: 39% GCE A level: 34% Secondary: 22% Primary: 5%	**<0.01** **$F_{3,365}$=9.92** **University**	**<0.01** **$F_{3,363}$=17.40** **University**	**<0.01** **$F_{3,362}$=** **10.02** **University**	**<0.01** **$F_{3,361}$=** **4.55** **University**	0.13 $F_{3,361}$= 1.90
Maternal BMI (first trimester)	25.9 (4.6)	0.53 r=-0.03	0.06 r=-0.10	0.46 r=-0.03	0.20 r=-0.07	0.26 r=-0.06
Sex of Child	58% Male	0.20 T_{363}=-1.29	**0.01** **T_{366}=-2.59** **Female**	**0.02** **T_{355}=-2.42** **Female**	0.15 T_{340} =-1.44	0.23 T_{362} =1.43
Gestational Age at Delivery (weeks)	38.7 (1.3)	0.64 r=-0.02	0.84 r=0.01	0.47 r=0.04	0.60 r=0.03	0.97 r=0.00
Premature (before 37 weeks)		0.13 T_{34}=-1.54	0.08 T_{29}=-1.82	0.80 T_{28}=0.26	0.27 T_{28}=-1.13	0.82 T_{30}=0.23
Child's age in days	733 (16)	**0.01** **r=0.14**	0.07 r=0.09	0.11 r=0.08	**0.00** **r=0.20**	0.99 r=0.00
Adjusted Birth weight (grams)	3122 (345)	0.69 r=-0.02	0.06 r= -0.10	0.70 r=-0.02	0.69 r=-0.02	0.20 r=-0.07
Gestational Diabetes Mellitus	GDM: 20%	0.02 T_{115}=-2.29 **GDM**	0.13 T_{117}=-1.53	0.02 T_{106}=-2.36 **GDM**	0.04 T_{118}=-2.03 **GDM**	0.26 T_{132}=1.13
Smoking	Smoke: 40%	0.03 T_{300}=2.13 **Nonsmoker**	< 0.01 T_{328}=3.68 **Nonsmoker**	0.09 T_{319}=1.69	0.24 T_{322}=1.17	0.83 T_{306}=0.22

Supplementary Table 2: Mass and retention time for unidentified compounds achieving the minimum q-value. Bolded compound appears in the Multivariate predictor.

Retention Time (minutes)	Direction of association	p-value
12.59	**neg**	**0.019**
15.24	neg	0.021
15.80	neg	0.021
15.78	neg	0.017
17.01	pos	0.023
17.58	neg	0.019
18.68	neg	0.016
23.89	neg	0.014
29.83	pos	0.014
29.98	neg	0.018
31.81	neg	0.009

Supplementary Table 3: Selected Multi-metabolite Model. Response is raw expressive language score. Metabolite predictors (bold) are on the natural log scale; the coefficient reflects the effect of a 1 standard deviation change.

Predictor	Coefficient	p-value
Intercept (Male Sex, Highest Maternal Education Primary, Chinese Ethnicity)	27.96	<0.001
Highest Maternal Education Secondary	1.99	0.144
Highest Maternal Education A level	2.92	0.027
Maternal Education University	5.55	<0.001
Malay Ethnicity	1.85	0.008
Indian Ethnicity	-0.59	0.442
Female Sex	1.72	0.002
Adipic Acid	**0.62**	**0.025**
Unknown (Retention time 12.59m)	**-0.57**	**0.038**
Phthalic Acid	**-0.59**	**0.032**